Radial Profile of Electron Density in a Coronal Hole from White Light Coronagraph Observations and Ulysses in situ and Radio Ranging Measurements and its Solar Wind Consequences

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Recent years have seen significant advances in our knowledge of the three-dimensional distribution of electron density in the corolla . White-light coronagraph measurements have provided improved models of the inner corona with which solar wind the.orics can bc compared, and a wide range of ray-like structures has been detected by radio occultation measurements. Like polarization brightness (pB) in the case of white-light, ranging or time-delay measured with spacecraft radio signals observes path-integrated electron density. Although the relationship between their probing abilities is better understood now, and features such as coronal streamers and plumes arc observed by both, a quantitiative comparison between simultaneous white-light and ranging measurements has never been made. It is especially important to show quantitative consistency between these measurements because combined ranging and white-light measurements make it possible to investigate the distribution of electron of white-light coronagraphs.

in this paper wc conduct a quantitative comparison between I 1 AO K-coronameter measurements, ranging mesurements made during the superior conjunction of Ulysses in 1995, and in situ plasma measurements by Ulysses spacecraft at 2.2 AU. Based on these measurements, a radial profile of electron densit y is deduced for coronal holes that extends from 1.15 Ro to 2.2 AU. This suggests that the acceleration of the polar solar wind is almost complete by 10 R_o, much closer to the Sun than had been expected.